

1                   1.     An apparatus for finding and immobilizing a workpiece in its free  
2     state so as to establish a net datum position of said workpiece, said apparatus comprising:  
3                   at least one pair of opposed pads;  
4                   means for advancing said at least one pair of opposed pads from a  
5     retracted position to an advanced position in contact with opposite portions of said  
6     workpiece so as to find said workpiece without measurably displacing said workpiece;  
7     and  
8                   means for locking said at least one pair of opposed pads in said  
9     advanced position, whereby said at least one pair of opposed pads lock in place so as to  
10    immobilize said workpiece in its free state.

1                   2.     The apparatus as claimed in claim 1, further comprising:  
2                   unlocking means for unlocking said at least one pair of opposed  
3     pads so as to release said workpiece; and  
4                   retracting means for retracting said at least one pair of opposed  
5     pads from said advanced position to said retracted position clear of said workpiece.

1                   3.     The apparatus as claimed in claim 2, wherein said advancing  
2     means and said retracting means comprises:  
3                   a spring for biasing each pad of said at least one pair of opposed  
4     pads toward said retracted position; and  
5                   means for pneumatically actuating each pad of said at least one  
6     pair of opposed pads toward said advanced position.

1                   4.     The apparatus as claimed in claim 3, wherein said locking means  
2     and said unlocking means comprises a hydraulic locking device associated with each pad

3 of said at least one pair of opposed pads to lock each pad of said at least one pair of  
4 opposed pads in said advanced position.

1 5. The apparatus as claimed in claim 4, wherein said advancing  
2 means, said retracting means, said locking means, and said unlocking means comprise a  
3 work support device of the pneumatic-advance, hydraulic-lock, and spring-retract type.

1 6. The apparatus as claimed in claim 5, wherein:  
2 each pad of said at least one pair of opposed pads comprises a  
3 workpiece contact side and a locking side opposite said workpiece contact side; and  
4 said advancing means and said retracting means comprise a pair of  
5 fluidic cylinder devices mounted between said at least one pair of opposed pads in  
6 contact with said workpiece contact sides of said at least one pair of opposed pads, and  
7 said locking and unlocking means comprise a pair of locking fluidic cylinder devices in  
8 contact with said locking sides of said at least one pair of said opposed pads.

1 7. An apparatus for finding and immobilizing a chassis frame in its  
2 free state, despite within-tolerance variations in size or location of said chassis frame, so  
3 as to establish a net datum position of said chassis frame to enable net datum features to  
4 be fabricated net to a fixture and in design-intent position on said chassis frame, said  
5 apparatus comprising:

6 a pair of opposed hydraulic units, each hydraulic unit of said pair  
7 of opposed hydraulic units being disposed on opposite sides of a portion of said chassis  
8 frame such that said portion of said chassis frame is between said pair of opposed  
9 hydraulic units, each hydraulic unit of said pair of opposed hydraulic units comprising:

10 a plunger mounted displaceably therein and terminating in  
11 a pad, said plunger being normally biased toward a retracted position clear of said chassis  
12 frame;

13 means for advancing said plunger from said retracted  
14 position to an advanced position, such that said pad contacts said chassis frame without  
15 measurably displacing said chassis frame; and

16 means for locking said pad in said advanced position, so as  
17 to immobilize said chassis frame in its free state between said pair of opposed hydraulic  
18 units.

1 8. The apparatus as claimed in claim 7, further comprising:

2 a stationary support positioned on one side of said chassis frame,  
3 one hydraulic unit of said pair of opposed hydraulic units being mounted to said  
4 stationary support; and

5 a movable support positioned opposite said stationary support on  
6 an other side of said chassis frame, the other hydraulic unit of said pair of opposed  
7 hydraulic units being mounted to said movable support.

1 9. The apparatus as claimed in claim 8, wherein said movable support  
2 moves between a home position and a work position, said home position being distal said  
3 chassis frame to permit said chassis frame to be loaded in position with respect to said  
4 apparatus, said work position being proximate said chassis frame to permit said pair of  
5 opposed hydraulic units to find and immobilize said chassis frame.

1 10. The apparatus as claimed in claim 9, wherein each hydraulic unit  
2 of said pair of opposed hydraulic units further includes a spring therein biased against  
3 said pad to retract said pad toward said retracted position.

1                    11.     An apparatus for finding and immobilizing a chassis frame in its  
2     free state, despite tolerance variations in size or location of said chassis frame, so as to  
3     establish a net datum position of said chassis frame to enable net datum features to be  
4     fabricated net to a fixture and in design-intent position on said chassis frame, said  
5     apparatus comprising:

6                    a pair of fixed platens comprising one platen and an opposite  
7     platen mounted opposite said one platen, said opposite platen being spaced a  
8     predetermined distance apart from and substantially parallel to said one platen;

9                    a plurality of guide bars extending between said pair of fixed  
10    platens;

11                  a pair of displaceable pads mounted about said guide bars between  
12    said pair of fixed platens, said pair of displaceable pads comprising one pad and an  
13    opposite pad mounted opposite said one pad, said opposite pad being mounted about said  
14    guide bars a spaced predetermined distance apart from and substantially parallel to said  
15    one pad, said pair of displaceable pads being displaceable from a retracted position distal  
16    from said chassis frame to an advanced position in contact with said chassis frame;

17                  displacing means, positioned between said pair of displaceable  
18    pads, for displacing said pair of displaceable pads between said retracted position and  
19    said advanced position into contact with opposite reference surfaces on said chassis frame  
20    without measurably displacing said chassis frame so as to find said chassis frame; and

21                  locking means, positioned between said pair of fixed platens and  
22    said displaceable pads, for locking said pair of displaceable pads in said advanced  
23    position so as to immobilize said chassis frame in said free state.

1                    12.     An apparatus as claimed in claim 11, further comprising:

2 a base structure; and  
3 a support displaceably mounted to said base structure and being  
4 displaceable between a home position distal said chassis frame and a work position  
5 proximate said chassis frame, said pair of fixed platens mounting to and extending from  
6 said support.

1 13. An apparatus as claimed in claim 12, wherein said locking means  
2 comprises a pair of locking cylinders positioned between said pair of fixed platens and  
3 said pair of displaceable pads, said displacing means comprising a pair of finding  
4 cylinders positioned between said pair of displaceable pads.

1 14. An apparatus as claimed in claim 13, wherein said pair of locking  
2 cylinders comprises hydraulic work supports and said pair of finding cylinders comprise  
3 hydraulic cylinders.

1 15. An apparatus as claimed in claim 13, wherein said pair of locking  
2 cylinders comprises hydraulic work supports and said pair of finding cylinders comprise  
3 pneumatic cylinders.

1 16. A method of finding and immobilizing a workpiece in its free state  
2 despite within-tolerance variations in size or location of said workpiece so as to establish  
3 a net datum position of said workpiece to enable net datum features to be fabricated net to  
4 a fixture and in design-intent position on said workpiece, said method comprising the  
5 steps of:

6 mounting said workpiece in its free state atop said fixture;  
7 advancing an opposed pair of pads from a retracted position to an  
8 advanced position in contact with opposite portions of said workpiece without

9 measurably displacing said workpiece despite said tolerance variations, such that said  
10 opposite portions of said workpiece are between said opposed pair of pads; and

11 locking said opposed pair of pads in said advanced position against  
12 said opposite portions of said workpiece so as to immobilize said workpiece in said free  
13 state.

1 17. The method as claimed in claim 16, further comprising the steps  
2 of:

3 unlocking said opposed pair of pads; and  
4 retracting said opposed pair of pads from said advanced position to  
5 said retracted position such that said workpiece may be withdrawn from said fixture.